

**A LIQUID CRYSTAL DISPLAY FOR TESTING DEFECTS OF  
WIRING IN PANEL**

**BACKGROUND OF THE INVENTION**

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**1. Field of the Invention**

The present invention relates generally to a liquid crystal display and, more particularly, to a liquid crystal display capable of testing defects of wiring in panel.

**2. Description of the Prior Art**

Figs. 1A to 1C are drawings showing a Module structure of conventional liquid crystal display.

As shown in the drawings, Fig. 1A comprises a X-PCB 2 for supplying graphic signals to a panel 1, a Y-PCB 4 for applying TFT driving signals and a FPC 7 for connecting the PCBs.

And, Fig. 1B shows a structure that the FPC 7 is removed and Fig. 1C shows that the Y-PCB 4 is removed and signals for driving gate driver integrated circuit IC are

applied through wiring in the panel 1.

Here, panels of each module have different shapes and wiring for driving gate driver IC is formed on the upper  
 5 part of array substrate of panel.

Fig. 2 is a drawing showing a conventional method of panel test. Referring to Fig. 2, odd lines of data lines (D1, D2 ...Dn) are connected to data odd pad 17a and even lines of the data lines (D1, D2...Dn) are connected to data even pad 17b.  
 10 In the same method, gate lines (G1, G2...Gn) are connected to gate odd pad 15a and gate even pad 15b. And, Vcom pad 13 is connected to all pixels of TFT array 11 on panel and wiring 20 is formed on the corner of upper part of panel 10.

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Then, signals are applied to five resulting pads in order to test whether a unit pixel is normally operated or not. That is, it is possible to test short of line and pixel by applying voltage to the gate odd pad 15a, the gate even  
 20 pad 15b, the data odd pad 17a, the data even pad 17b and the Vcom pad 13.

However, the conventional liquid crystal display has a disadvantage that it is difficult to test disconnection and

short by wiring formed on the upper part of panel and additional device is required to test defects of wiring.

### SUMMARY OF THE INVENTION

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Therefore, the present invention has been made to solve the above problems and an object of the present invention is to provide a liquid crystal display for testing defects of wiring in panel capable of testing disconnection and short of wiring in panel when signals are applied by connecting data line or gate line or common voltage line in panel to each pad through wiring formed on the outside of panel in a zigzag shape.

15 In order to accomplish the above object, the present invention comprises: a TFT array unit comprising a plurality of gate lines and data lines formed in a matrix shape, having TFT transistors at the intersection of the gate line and the data line; a data pad unit commonly connected to the  
20 plurality of data lines, receiving signals for driving the data line; and a wiring unit for testing defects of data line connected between the data pad unit and the data line, testing disconnection and short of the data line.

The data pad unit comprises a first data pad unit commonly connected to the odd data line of the plurality of data lines, receiving signals for driving the odd data line and a second data pad unit commonly connected to even data line of the plurality of data lines, receiving signals for driving the even data line.

The wiring unit for testing defects of data line comprises a first wiring unit for testing defects of data line connected between the first data pad unit and the odd data, testing disconnection and short of the odd data line and a second wiring unit for testing defects of data line connected between the second data pad unit and the even data line, testing disconnection and short of the even data line.

The first and the second wiring units for testing defects of data line are formed in a zigzag shape.

According to another embodiment of the present invention, a liquid crystal display for testing defects of wiring in panel comprises: a TFT array unit comprising a plurality of gate lines and data lines formed in a matrix shape, having TFT transistors at the intersection of the gate lines and the data lines; a gate pad unit commonly connected to the

plurality of gate lines, receiving signals for driving the gate line; and a wiring unit for testing defects of gate line connected between the gate pad unit and the gate line, testing disconnection and short of the gate line.

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The gate pad unit comprises a first gate pad unit commonly connected to odd gate line of the plurality of gate lines, receiving signals for driving the odd gate line and a second gate pad unit commonly connected to even gate line of the plurality of gate lines, receiving signals for driving the even gate line.

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The wiring unit for testing defects of gate line comprises a first wiring unit for testing defects of first gate line connected between the first gate pad unit and the odd gate line, testing disconnection and short of the odd gate line and a second wiring unit for testing defects of second gate line connected between the second gate pad and the even gate line, testing disconnection and short of the even gate line.

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The first and the second wiring units for testing defects of gate lines are formed in a zigzag shape.

According to still another embodiment of the present invention, a liquid crystal display comprises: a TFT array unit comprising a plurality of gate lines and data lines formed in a matrix shape, having a TFT transistors on each pixel at the intersection of the gate line and the data line; a common voltage pad unit for applying common voltage to common voltage line connected to each pixel; and a wiring unit for testing defects of common voltage line connected between the common voltage line and the common voltage pad unit, testing disconnection and short of the common voltage line.

The common voltage pad unit comprises a first common voltage pad unit commonly connected to odd common voltage line of the plurality of common voltage lines, receiving signals for driving the odd common voltage line and a second common voltage pad unit commonly connected to even common voltage line of the plurality of common voltage lines, receiving signals for driving the even common voltage line.

The wiring unit for testing defects of common voltage line comprises a first wiring unit for testing defects of common voltage line, connected between the first common voltage pad unit and the odd common voltage line, testing

disconnection and short of the odd common voltage line and a second wiring unit for testing defects of common voltage line, connected between the second common voltage pad unit and the even common voltage line, testing disconnection and short of the even common voltage line.

The first and the second wiring units for testing defects of common voltage line are formed in a zigzag shape.

According to the present invention, it is possible to test defects of wiring in panel by a conventional panel test method, thereby improving reliability of panel.

#### BREIF DESCRIPTION OF THE DRAWINGS

Figs. 1A to 1C are drawings showing module structure of general liquid crystal display.

Fig. 2 is a drawing showing a conventional panel test method.

Figs. 3A and 3B are block diagrams showing a liquid crystal display for testing defects of wiring in panel according to the present invention.

Figs. 4A and 4B are drawings showing a method of testing disconnection and short of wiring in panel according to the present invention.

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#### DETAILED DESCRIPTION OF THE INVENTION

The above objects, and other features and advantages of the present invention will become more apparent after reading the following detailed description when taken in conjunction with the appended drawings.

Figs. 3A and 3B are drawings showing a method of testing wiring in panel according to the present invention.

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Referring to Fig. 3A, a TFT array unit 11 in panel 10 is arranged with a plurality of gate lines  $G_1, G_2 \dots G_n$  and data lines  $D_1, D_2 \dots D_n$  from the TFT array unit. The odd lines of the gate lines  $G_1, G_2 \dots G_n$  are connected to a gate odd pad 15a and the even lines are connected to a gate even pad 15b. The data lines  $D_1, D_2 \dots D_n$  are connected to a data odd pad 17a and a data even pad 17b. The zigzag connection wiring 30a on the upper part of panel 10 is connected to a first line D1 of the data odd pad 17a in series.



Referring to Fig. 3B, a test structure is formed in the same method as that in Fig. 3A. However, wiring is formed in a separated zigzag connection wiring 30b and then, connected to a first line D<sub>1</sub> of data odd pad 17a and a first line D<sub>2</sub> of data even pad 17b in series. Therefore, it is possible to test disconnection and short of wiring by applying signal for the test to data odd pad 17a and data even pad 17b. When short is generated, TFT of data even line 17b, whereto signal is not applied, is also operated as well as data odd line 17a.

Figs. 4A and 4B are drawings showing a method of testing disconnection and short of wiring in panel according to the present invention.

Referring to Fig. 4A, when disconnection is generated between wiring of panel, the disconnected wiring is connected to a first line D<sub>1</sub> of data odd pad 17a<sup>hb</sup>. Therefore, when signal is applied to the data odd pad 17a<sup>b</sup>, TFT of the disconnected first line D<sub>1</sub> is not operated and TFTs of other lines D<sub>3</sub>, D<sub>5</sub>... are normally operated.

Fig. 4B shows a method of testing defects when short is generated between wiring in panel. Referring to Fig. 4B, the

data odd pad 17a is connected to wiring connected to data even pad 17b. Therefore, when signal is applied to data odd pad 17a, TFT of second data line  $D_2$  is operated as well as TFT of the first data line  $D_1$ . If the two are operated at the same time, it is determined that short defects are generated.

Although it is not shown in the drawings, it is possible to test defects by connecting the same method to gate odd pad 15a and gate even pad 15b and by connecting the zigzag wiring 30a to the common voltage Vcom pad 13 in series.

As described above, according to the present invention, it is possible to test defects of wiring in panel by connecting wiring in a zigzag shape or by separating and connecting wiring in a zigzag shape and then, connecting the resultant to the gate pad unit, the data pad unit and the common voltage pad unit.

And, according to the present invention, it is possible to remove Flexible Printed Circuit FPC or Printed Circuit Board PCB, thereby reducing manufacturing cost and the size of product.

Although the preferred embodiment of this invention has

been disclosed for illustrative purpose, those skilled in the art will appreciate that various modifications, alterations, additions and substitutions are possible, without departing from the scope and spirit of the invention.

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